

**COOLING SYSTEM FOR A SEMICONDUCTOR DEVICE  
AND METHOD OF FABRICATING SAME**

**ABSTRACT OF THE DISCLOSURE**

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A cooling system for a semiconductor substrate includes a plurality of trenches formed from a backside of the semiconductor substrate, and thermally conductive material deposited in the plurality of trenches. A method of forming cooling elements in a semiconductor substrate, includes coating a backside of the semiconductor substrate with a first mask layer, forming a plurality of trench patterns in the first mask layer, etching the semiconductor substrate to form a plurality of trenches along the plurality of trench patterns, and depositing thermally conductive material in the plurality of trenches. Trenches constructed from the backside of a wafer improve efficiency of heat transfer from a front-side to the backside of an integrated-circuit chip. The fabrication of trenches from the backside of the wafer allows for increases in the depth and number of trenches, and provides a means to attach passive and active cooling devices directly to the backside of a wafer.